DEC 12 1987

United States General Accounting Office

GAO

Report to the Chairman, Committee on Governmental Affairs, U.S. Senate

COMPLETED

November 1986

QUALITY ASSURANCE

Efforts to Strengthen DOD's Program

GAO/NSIAD-87-33

ORIGINAL

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-225066

November 3, 1986

The Honorable William V. Roth, Jr.
Chairman, Committee on Governmental Affairs
United States Senate

Dear Mr. Chairman:

This report responds to your request that we conduct an evaluation of the Department of Defense's (DOD's) quality assurance program. Congressional hearings and other public disclosures have raised serious concerns about the quality of the weapons DOD buys.

DOD's in-plant quality assurance program was initiated to assure that major weapons producers comply with contract quality assurance requirements. These are the technical requirements relating to the quality of the product, and contract clauses prescribing inspection and other quality controls incumbent on the contractor to assure that products meet contract specifications.

The quality assurance program is carried out by Plant Representative Offices (PROs) of the Army, Navy, Air Force, and the Defense Contract Administration Service (DCAS), a part of the Defense Logistics Agency (DLA). The PROs generally administer all contracts at a plant regardless of the service awarding the contract.

We believe the present in-plant quality assurance program is not as effective as it should be in ensuring that quality products are delivered to field activities. Evidence of this ineffectiveness can be found in service and DLA studies which document that many contractors are not adequately controlling quality and producing hardware which conforms with contract requirements.

Moreover, we were able to identify some of the factors which hamper the PROs' oversight activities and increase DOD's risk of accepting defective products. While individual services and DLA are attempting to correct some of these problems, we did not find a comprehensive plan for improving the in-plant quality assurance program DOD-wide. Uniform implementation of quality programs is DOD's policy, and an Office of the Secretary of Defense (OSD) study effort reaffirms the value of uniform quality procedures.

Service Reviews Find Contractor Quality Deficiencies

Service and DLA reviews have identified widespread contractor quality deficiencies. For example, the Air Force Contract Management Division (AFCMD) initiated Contractor Operations Reviews (COR) to determine how well contractors were complying with contract quality requirements. Led by AFCMD officials, the COR teams found deficiencies at most plants under Air Force cognizance. The problems identified were not limited to just the contractors quality assurance function, but spanned all eight functional areas that can impact on product quality—Manufacturing, Materiel Management, Contract Management, Subcontract Management, Safety and Fire Protection, Engineering, Quality Assurance, and Product Integrity.

Our review of the 24 Air Force COR reports published between September 1984 and March 1986, indicates that only three plants received satisfactory ratings in all functional areas reviewed. Ten plants were rated less than satisfactory (marginal or unsatisfactory) in four or more of the eight functions.

The Air Force COR teams concluded that 12 of the 24 plants had less than satisfactory quality assurance functions, and 13 of the 24 plants were less than satisfactory in the "product integrity" function. Findings in the latter function included defective hardware, deficient work instructions, and failure to test hardware in a manner that would duplicate end use. One contractor received an unsatisfactory rating because approximately 40 percent of the hardware being manufactured was defective, and inspection was passing approximately 24 percent defective material. Another contractor was rated unsatisfactory because of the large number of defective items found among the hardware reviewed. At this plant, 38 percent of the pieces examined, using the contractors inspection criteria, were found to be deficient.

Both the Army and DLA conducted special reviews to determine if contractors were preventing, rather than "inspecting-out," defects. Effective quality controls should reduce the risk of nonconforming items being accepted and shipped to the customer and also should reduce the cost of manufacturing. Three of the five prime contractors the Army reviewed received ratings of "fair" in controlling vendor quality, and two of the three received ratings of "fair" in ensuring effective in-house process controls. DLA gave unacceptable ratings to 79 percent of the 224 prime contractors it had reviewed as of the end of fiscal year 1985, because they were not adequately controlling the quality of subcontracted material.

Quality deficiencies have also been identified when services disassemble or "teardown" delivered hardware. For example, a report on a Navy teardown of a missile, conducted in December 1984, disclosed the following major defects—"Inspection Escapes" (Missing hardware, debris, conformal coating bubbles, fractured solder connections); "rework areas exhibited overheating"; "uninsulated wires crossed circuit runs." The teardown team concluded that the missile was unacceptable. A proposal for a formal Navy hardware teardown policy indicates that deficiencies such as these are not unusual. According to this proposal, teardown inspections confirm that many undesirable practices still exist in both development and production phases, even with the increased emphasis on product quality. This assessment is based on the Navy's detailed review of several systems which revealed similar design or manufacturing related problems.

PRO Quality Assurance Programs Do Not Fully Implement FAR Requirements

The Federal Acquisition Regulation (FAR) requires PROs to

- perform all actions necessary to verify whether the supplies or services conform to contract quality requirements and
- discourage the repeated tender of nonconforming supplies and services, including those with only minor nonconformances, by appropriate action, such as rejection and documenting the contractor's performance record.

To achieve the latter requirement, PROs need to be able to identify recurring deficiencies, and ensure that the contractor corrects the root cause to avoid the same mistakes. In fact, DOD inserts into contracts a requirement for contractors to maintain a program for the prevention and ready detection of discrepancies and for timely and positive corrective action.

To determine if these requirements were being met by the existing in-plant program, we evaluated PROs' activities at two plants. Our evaluation focused on the Army PRO (ARPRO) at Boeing Vertol, Ridley Park, Pennsylvania, and the Navy PRO (NAVPRO) at McDonnell Douglas, St. Louis, Missouri, and their oversight of the contractors quality program on the CH-47D helicopter and the F/A-18 fighter aircraft, respectively.

Overall, we found that the FAR's requirements were not being met because the PROs delegated some of their inspection responsibilities to the contractors and did not perform all mandatory inspections they

established to assure product quality. We also found that the PROs are hampered in their efforts to discourage the repeated tender of nonconforming products because neither the PROs nor the contractors have the data needed to readily identify recurring contractor deficiencies.

Agreements to Delegate Government Inspections to Contractors

Both the ARPRO and the NAVPRO have agreements allowing the contractors they oversee to perform government inspections for the PRO when PRO quality assurance specialists are not available. In the ARPRO's case, this delegation of responsibility is called "deputy stamping." We were informed by an ARPRO official at Boeing Vertol that deputy stamping principally occurs during the second work shift at Boeing Vertol and on Saturday and Sunday when the PRO is not fully staffed.

Although both ARPRO and Boeing Vertol officials informed us that the use of deputy stamping was minimal, we found that the ARPRO's Quality Management Information System was understating the actual number of occurrences. For example, information obtained from the Quality Management Information System shows that in calendar year 1985, a total of 35,008 Product Verification Inspection (PVI) actions were accomplished and only 68 or .2 percent were deputy stamped. According to this system, four of these 68 deputy stamping actions occurred in the Boeing Vertol transmission shop. However, our review of the transmission shop deputy stamping log for just the last 6 months of 1985 showed that 39 deputy stamping actions occurred.

Government Mandatory Inspections Not Performed

We found instances where mandatory government inspections were not performed by the ARPRO and NAVPRO. Mandatory government product inspections are independent of the contractor's inspection activity. These inspections are established by the government to provide direct assessment of specific characteristics and processes of particular importance to the quality of the end item and to verify that the end item meets contract quality requirements before it is accepted by the government.

In the Navy's case, we reviewed NAVPRO Quality Management Information System data, and other NAVPRO and McDonnell records provided by the NAVPRO, to determine whether the six mandatory government product inspections required on each aircraft or subassembly were performed by the government on the 84 F/A-18s accepted during fiscal year 1985. Although Navy instructions require the NAVPRO to assure that government personnel are available to perform mandatory inspections,

we found no records to show that the NAVPRO performed all required inspections on 10 of the 84 aircraft (12 percent) accepted by the government. An additional seven aircraft did not receive one of the six inspections, but NAVPRO representatives believed that the aircraft passed the inspection point before the inspection requirement was established, although they could not provide documentation which supported this belief.

In the Army's case, all continuing PVIs and the final inspections are considered mandatory for the CH-47D helicopter. Continuing PVIs are intended to provide on-going in-process inspection of major assemblies and end items. For fiscal year 1985, we found that 25 percent of the mandatory PVIs were not accomplished. While some inspections were deputy stamped, most were simply not done. We also found that the ARPRO waived final inspections on 4 of the 31 CH-47D helicopters delivered to the Army in fiscal year 1985. The last such waiver noted occurred on a helicopter delivered in March 1985.

PROs Do Not Have a System to Identify Recurring Quality Problems

We found that the PROs cannot readily identify recurring quality defects using existing plant data. For example, McDonnell Douglas and the NAVPRO each have extensive quality data (records, files, summaries, and reports) that record and summarize their quality assurance activities. However, they do not jointly or independently have a record, file, summary, or report which can be used to readily identify recurring quality problems and the frequency of recurrence. Determining whether a problem is recurring requires research into several data bases.

Services Fault Existing Approach but Have Not Agreed on Resolution

Service officials identified problems such as not providing effective methods of surveillance, and not attracting and retaining qualified personnel, as weakening PRO operations.

Air Force Concerns

The Contractor Management System Evaluation Program (CMSEP) is the Air Force PRO's (AFPRO) primary tool for evaluating contractor management systems. It consists of a structured inquiry which the AFPROs use to verify the existence of contractor documented management systems; evaluate the adequacy of each element of the system according to Air Force standards, and then verify that a contractor is in compliance with

the documented system. The CMSEP technique has been evolving, but the principle that program effectiveness and ultimately product quality are a result of effective management systems has remained the same.

Officials at AFCMD began to question whether CMSEP was an effective verification tool once the CORs disclosed deficiencies that CMSEP should have revealed. Only 24 percent of the respondents to an internal Air Force survey believed that CMSEP was working. Other respondents complained that the system tended to get "bogged down with trivia," required too much paperwork, and was too detailed. Respondents also complained that CMSEP could produce "tunnel vision" if evaluators only looked at what was required.

One AFCMD COR team leader told us the major difference between the COR approach and the AFPRO's CMSEP is that the AFPROs spend 98 percent of their time working on satisfactory systems and only 2 percent of their time working on problems—the reverse is true for the COR. Another Air Force COR team leader added that since hands-on hardware inspections are not emphasized, the process is evaluated without looking at the results (products) of the process. Both COR team leaders believed that CMSEP may not be effective in identifying major system problems.

Navy Concerns

The Secretary of the Navy discussed the Navy's concerns in a memorandum to the Secretary of Defense dated November 18, 1985. He stated that many items produced to support the most visible programs in the Naval Air Systems Command were found to be defective at a rate greater than 20 percent and that in most of those cases, the items had been accepted for the government by the Defense Contract Administration Service PRO at the vendors' plants. The Secretary attributed the rise in defects to a deterioration in quality assurance oversight that had occurred since DCAS was created to administer many of the services contracts. According to the Secretary, field emphasis had shifted from inspection of the product to approval of the contractor's manufacturing quality assurance process, but DLA had not provided, nor had it been staffed to provide, adequate oversight of the process as well as its final result. He strongly recommended that DOD reverse the decision to centralize these quality assurance functions and that a plan be drawn up to return these "critical functions" to the line management of the military departments. This recommendation was ultimately rejected.

DLA Says Work Force Problems Hamper Efforts

DLA has called attention to problems in hiring and retaining quality assurance specialists. For example, in a June 1985 memorandum to the Deputy Secretary of Defense, the Director of DLA pointed out that GS-9s represent 48 percent of the total DLA quality personnel assigned to DCAS in fiscal year 1984. Yet, 63 percent of the attrition rate was at this grade level. The exodus of GS-9s necessitates continuous recruitment of untrained personnel, resulting in higher costs and the added burden of constant training. According to the Director, high turnover and instability in the quality assurance work force has a "direct, consequential effect on the acquisition of $50 billion dollars worth of DOD products annually."

In particular, DLA cites job classification problems which it believes stem from an improper emphasis on product complexity over job complexity. This means that the grade of the position is based more on the complexity of the product the quality assurance specialist oversees than it is on the complexity of the specialist's job of surveillance.

Other service officials have questioned requirements for entry into the profession. According to the Deputy Chief of Staff for Product Assurance and Testing, Army Materiel Command, interns currently being hired are from areas of "soft" education, such as, english or history. Yet, people in the plant need to be familiar with manufacturing processes, as well as math and statistics. The Navy is also exploring what skills, knowledge, and abilities are needed to improve the quality of its products.

OSD Proposes a New Approach but No Consensus Among Services and DLA

DOD Directive 4155.1 states that DOD components shall, "develop and use joint procedures for uniform implementation of quality programs." Part of the rationale for uniform implementation is that PROs verify the quality of all DOD products at the plants they oversee, not just those bought by their own service. Therefore, each service has a vested interest in effective quality programs DOD-wide.

The former Assistant Secretary of Defense for Acquisition and Logistics, in his paper, DOD Acquisition Improvement - The Challenges Ahead, suggested a new approach to quality assurance, including two proposals which specifically address the in-plant program as it relates to major weapons. One proposal calls for a total overhaul of program guidance and another calls for professionalizing the quality assurance work force by hiring more engineers and reducing the number of quality assurance specialists.

OSD's Director of Industrial Productivity and Quality has not directed uniform implementation of these proposals. Instead, he prefers that service and DLA officials on the DOD Quality Assurance Council reach agreement on changes. The Director believes the services and DLA will be more willing to implement actions they initiate themselves.

Although the Director believed that the services and DLA were starting "to coalesce in one direction," this was not evident in the initiatives we observed. For example, in terms of DOD's approach to quality assurance, the Air Force believes the PRO's primary emphasis should be to review the contractor's quality assurance system to determine if it complies with government standards. This is based on the theory that if the contractor's system is in compliance with government standards, the contractor's products will conform to contract. The Commander, Air Force Systems Command, reaffirmed this view in June 1985, when he wrote, "the objective of an inspection program is not for the government to screen contractor presented hardware, but to verify the adequacy of the contractor's inspection system." Therefore, one Air Force initiative involves "revitalizing" CMSEP, the Air Force program for evaluating contractor management systems.

However, the Navy is suggesting that the government delete its requirement that contractors conform to a government quality assurance program standard. Instead, it proposes to determine contractor compliance by monitoring yields at "defect reduction control points" throughout the production process. The Navy calls this approach "in-process validation."

DOD Quality Assurance Council Has Not Developed DOD-Wide Solutions

As stated earlier, DOD Directive 4155.1 tasks the services and DLA to develop and use joint procedures for uniform implementation of quality programs. The DOD Quality Assurance Council, composed of senior officials, is responsible for quality assurance and is the DOD "decision-making" body on quality issues. DOD Directive 4155.1 empowers DOD's Quality Assurance Council to develop solutions to common problems and implement new initiatives.

However, we found that the Council had not developed DOD-wide solutions to quality problems. One Council member suggested that the Council was more of a forum for sharing ideas than a decision-making body.

In reviewing the activities of the Council we found that:

- The Council's meeting of July 31, 1985, was the first since September 1983. An OSD official told us that OSD's policy used to be that the Council did not need to meet unless there were problems.
- At the meeting held on December 18, 1985, the Council rejected the Navy proposal to return the Quality Assurance oversight function to the military departments rather than continue with DCAS oversight. The Council reasoned that a "line organization change would not accomplish the desired result of better quality," and that the Council should instead "immediately attack the issue of a better approach to quality."
- We found no evidence that any significant action resulted from the Council meeting of January 24, 1986, nor the meeting on February 5, 1986, which was the most recent meeting held as of September 1986.

We also found the Council had not followed through on a previous Council-sponsored effort to improve the in-plant quality assurance program. In January 1984 the Office of the Under Secretary of Defense (Research and Engineering), issued A Study of Various Approaches in DOD for Performing Quality Assurance Management. This study was initiated by the Quality Assurance Council in January 1981, and was intended to identify the best practices of the existing service programs for possible adoption DOD-wide.

The study report states that this objective was the essence of a recommendation that originated from a DOD Quality Assurance Conference held in March 1980. During this conference it was noted that:

"...no attempt has been made by DOD or the military services to create an environment for the selection of the most efficient and effective techniques which could then be used by all services. One of the advantages of this uniform approach would be the elimination of the serious impact that in-plant cognizance changes have on major DOD contractors."

In January 1981 the DOD Quality Assurance Council determined that development of more uniform procedures was one of the ten most important recommendations to come out of the conference and assigned it to a study team for action. Each of the services and DLA contributed members to the study team which began work in March 1983.

The study team concluded that (1) there was no peculiar and compelling reason for not adopting an optimum approach for accomplishing a work element and (2) there were also sufficient grounds for adopting a

common approach where there is not an optimum way. They recommended that a new DOD or joint services/DLA document should be established to describe a single in-plant quality assurance procedure, derived from existing procedures, utilizing optimum features where identified, for use by all service PROs.

The study concluded that uniform quality assurance procedures would produce 17 distinct benefits. For example, uniformity was seen as enhancing the one face to industry concept, enhancing fair and equitable treatment of contractors, facilitating understanding of the in-plant quality assurance program by purchasing offices, increasing the potential for measurement of quality assurance effectiveness, and improving training and promotion opportunities for in-plant quality assurance personnel. In addition to these benefits, the study team noted six other factors which argue for uniformity. One of the factors was that each buying office expects a satisfactory in-plant quality assurance program regardless of which service administers their contracts.

The study report stated that the study results were to be presented to the DOD Quality Assurance Council for action. However, OSD officials told us this never occurred. Because there was no consensus on the study recommendations, the head of the Quality Assurance Council concluded that the study represented standardization for standardization sake. We were informed that the full Council was never briefed on the study results.

OSD Proposes Test Program

OSD recently asked each service and DLA to consider testing the Navy's new in-process validation proposal. In a letter to the services, OSD's Director of Industrial Productivity and Quality stated that "this potentially cost effective approach may have merit for broader implementation." It was also suggested that it could become the basis for formulating DOD quality policy. This proposal was still in the planning stages when we concluded our work in September 1986, and no formal commitment to test the Navy approach had been made.

Conclusions

Each military service and DLA has developed and implemented its own in-plant quality assurance program. Although the need for improvement in the programs has been discussed for years, progress in identifying the changes needed and in implementing new initiatives DOD-wide has not occurred.

DOD-wide decision-making authority rests with the DOD Quality Assurance Council. While recognizing the need for change, the Council has made little progress in bringing about improvements for the program, as a whole. Rather, the Council leadership has allowed each service to work toward improving its respective programs. Given DOD's policy of uniform implementation, and the many benefits the services attribute to uniform quality assurance procedures, we do not believe these individual efforts should be considered a substitute for a DOD-wide initiative.

Recommendations

We recommend that the Secretary of Defense instruct the Quality Assurance Council to (1) facilitate the interchange of ideas between the services and DLA and as necessary, direct the implementation of specific improvements to DLA and service programs and (2) prepare and carry out a long range plan for developing and implementing a DOD-wide optimum quality assurance plan. This latter step should include close coordination with industry, the services and DLA, and quality assurance experts.

At your request, we did not provide a draft of this report to DOD for its review and comment. We did, however, informally discuss the issues with knowledgeable personnel and incorporated their comments where appropriate.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,

Frank C Conahan

Frank C. Conahan
Assistant Comptroller General

Objectives, Scope, and Methodology

We evaluated DOD's in-plant quality assurance program at the request of the Chairman, Senate Committee on Governmental Affairs. The Chairman expressed concern that many of the quality deficiencies in major weapons result from weaknesses in the systems designed to prevent the sale of poor quality products to the government.

We agreed to conduct an evaluation of DOD's in-plant quality assurance program for major weapons by reporting on the following two objectives:

(1)Are there weaknesses in DOD's in-plant program for verifying that contractor's are producing quality products?

(2)If DOD's in-plant quality assurance program needs strengthening, what must DOD do to identify and initiate changes?

To address the first objective, we visited two plant representative offices—McDonnell Douglas, St. Louis, Missouri, (Navy) and Boeing Vertol, Ridley Park, Pennsylvania (Army)—and reviewed their plans and procedures for verifying contractor compliance with the quality assurance provisions of their contracts. We selected these locations primarily because of the significant dollar volume of contracts administered.

To test how the PROS' quality assurance program is actually carried out, we selected one major weapon at each plant (the F/A-18 aircraft and CH-47D helicopter, respectively) and used agency and contractor records to identify recurring quality deficiencies. We developed case studies which address how quality problems, once identified, are surfaced and resolved. We looked primarily for recurring problems because this condition would indicate a more serious breakdown in the quality assurance program.

To supplement our observations at the plants, we visited DOD's Office of Industrial Productivity and Quality and service and DLA headquarters and/or commands having oversight responsibility for the in-plant quality assurance programs we reviewed. We asked each service and DLA to provide reports, studies, or other agency records which discussed (1) contractor conformance to the quality assurance provisions of their contracts and (2) the plant representative's program for verifying that contractors are adhering to contract quality assurance requirements. We also interviewed quality assurance officials to obtain their views on program strengths and weaknesses.

To address the second objective, we interviewed the focal points in each service, DLA, and DOD for proposing and implementing changes in the in-plant quality assurance program. We requested evidence of each services' initiatives and obtained their views on DOD's latest position paper, New Approaches to Quality Assurance, Chapter 1 of DOD Acquisition Improvement - the Challenges Ahead, Perspectives of the Assistant Secretary of Defense for Acquisition and Logistics, dated November 5, 1985.

We also obtained and reviewed selected studies addressing new concepts in quality assurance which DOD officials mentioned; and speeches, articles, congressional testimony, and other related evidence of DOD, DLA, and service views on improvements needed in DOD's program for ensuring contractor compliance. This included the recent activities of DOD's Quality Assurance Council. Emphasis was placed on determining if any of the proposals addressed improvements needed in the in-plant quality assurance program and if so, what progress had been made in sharing and adopting these proposals DOD-wide.

We requested that the services and DLA provide information developed internally, regarding the cost and other effects of poor quality. Our evaluation did not include an independent analysis of the these costs or "effects."

We conducted the review phase of our evaluation during November 1985 through September 1986, in accordance with generally accepted government auditing standards.

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are $2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.